ST ALOYSIUS COLLEGE EDATHUA

DEPARTMENT OF MATHEMATICS

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INTERNATIONAL DAY OF MATHEMATICS

E-GANITHAM

WHAT IS MATHEMATICS ?

Mathematics is the science and study of quality, structure, space and change. Mathematicians seek formulate out patterns, new conjectures, and establish truth deduction by appropriately rigorous from chosen axioms and definitions.

WHERE DOES IT BEGINS?

One of the earliest known mathematicians was Thales of Miletus. he has been hailed as the first true mathematician and the first known individual to whom a mathematical discovery has been attributed. The number of known mathematicians. grew when Pythagoras of Samos established the Pythagorean school, whose doctrine it was that mathematics ruled the universe and whose motto was "All is number".

ILLUSTRIOUS SCHOLARS OF MATHEMATICS

Welcome to the pages of E-Ganitham, a testament to the unparalleled commitment of the Department of Mathematics at St Aloysius College, Edathua, to the quest for mathematical knowledge. In this volume, we excavate the essence of mathematics, exploring its deep relevance, tracing its rich history, and highlighting its enduring significance and diverse practical applications.

Compiled by: I and II
M.Sc. Mathematics
Students

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Principal's Message

My dear Aloysian Mathematics family members,

I am delighted to extend my warmest congratulations to the Department of Mathematics on the launch of E Ganitham, an initiative aimed at promoting excellence in mathematics education.

E Ganitham is not merely a publication but a testament to our commitment to showcasing the relevance, significance, and practical applications of mathematics. Through its subsequent editions, I believe this platform will serve as a showcase for the diverse skills and talents of our students.

The current volume, with its exploration of the rich history of mathematicians and their groundbreaking discoveries, promises to be both enlightening and captivating. I commend the department for their dedication in bringing forth such a commendable e-journal.

On behalf of the entire institution, I extend my best wishes to the Department of Mathematics. May E Ganitham continue to inspire and foster a love for mathematics among its readers.

Warm regards,
Prof. Dr. Indulal G

Principal

Editorial Note

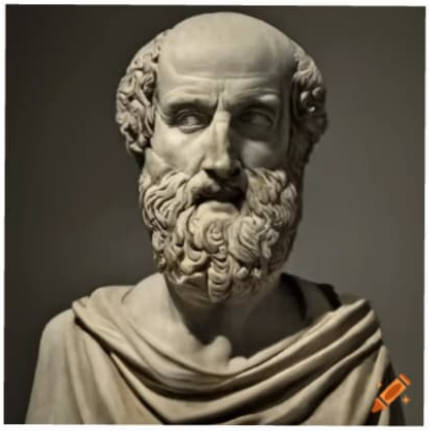
In this mathematical exploration, E-Ganitham emerges as a beacon, celebrating the intellectual endeavors of the great minds within the realm of mathematics. This volume not only commemorates the lives and contributions of renowned mathematicians but also aims to ignite an unmatched enthusiasm for the subject among our readers.

As we stand at the threshold of future volumes, the Department of Mathematics is excited to lead you on a journey deeper into the layers of mathematical mysteries. Our commitment extends beyond the familiar, as we aspire to uncover the unseen spheres of this captivating discipline, demonstrating its beauty and utility.

Join us as we continue our exploration, embracing the boundless possibilities that mathematics offers. The E-Ganitham Newsletter is not merely a publication; it is a testament to our ongoing quest for understanding, appreciation, and the enrichment of the mathematical landscape.

Swathi Suresh
Student Editor

Pythagoras of Samos



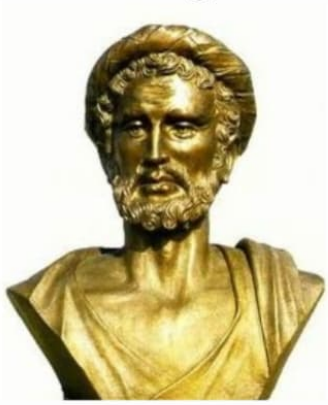
Pythagoras was a Greek philosopher who made important developments in mathematics, astronomy, and the theory of music. The theorem now known as Pythagoras's theorem was known to the Babylonians 1000 years earlier but he may have been the first to prove it.

He born about 570 BC in Samos,Ionia .Pythagoras of Samos is often described as the first pure mathematician.He is an extremely important figure in the development of mathematics yet we know relatively little about his mathematical achievements.His notable ideas were Communalism,Metempsychosis,Musica universalis and his Attributed ideas were Five climatic zones,Five regular solids,Proportions,Pythagorean theorem,Pythagorean tuning,Sphericity of the Earth and Vegetarianism.He died on 495 BC(aged around 75).

Pythagoras was credited with many mathematical and scientific discoveries, including the Pythagorean theorem, Pythagorean tuning, the five regular solids, the Theory of Proportions, the sphericity of the Earth, and the identity of the morning and evening stars as the planet Venus. It was said that he was the first man to call himself a philosopher ("lover of wisdom") and that he was the first to divide the globe into five climatic zones. Some accounts mention that the philosophy associated with Pythagoras was related to mathematics and that numbers were important, but it is debated to what extent, if at all, he actually contributed to mathematics or natural philosophy.

> “THERE IS GEOMETRY IN THE HUMMING OF THE STRINGS. THERE IS MUSIC IN THE SPACING OF THE SPHERES.”
>
> -PYTHAGORAS

Archytas



Archytas, believed to be born during 435/410 BC in Tarentum Magna Graecia, was an Ancient Greek mathematician, music theorist, statesman, and strategist from the ancient city of Taras (Tarentum) in Southern Italy. He was a scientist and philosopher affiliated with the Pythagorean school and famous for being the reputed founder of mathematical mechanics and a friend of Plato.

Archytas is said to be the first ancient Greek to have spoken of the sciences of arithmetic (logistic), geometry, astronomy, and harmonics as kin, which later became the medieval quadrivium. He is thought to have written a number of works in the sciences but only four genuine fragments are extant.

According to Eutocius, Archytas was the first to solve the problem of doubling the cube (the so-called Delian problem) with an ingenious geometric construction.

Archytas named the harmonic mean, important much later in projective geometry and number theory, though he did not discover it. Ptolemy considered Archytas the most sophisticated Pythagorean music theorist.

As a Pythagorean, Archytas believed that arithmetic (logistic), rather than geometry, provided the basis for satisfactory proofs, and developed the most famous argument for the infinity of the universe in antiquity.

Euclid

Euclid was an ancient Greek mathematician active as a geometer and logician.Considered the "father of geometry", he is chiefly known for the Elements treatise, which established the foundations of geometry that largely dominated the field until the early 19th century. His system, now referred to as Euclidean geometry, involved new innovations in combination with a synthesis of theories from earlier Greek mathematicians, including Eudoxus of Cnidus, Hippocrates of Chios, and Theaetetus. With Archimedes and Apollonius of Perga, Euclid is generally considered among the greatest mathematicians of antiquity, and one of the most influential in the history of mathematics.

The English name 'Euclid' is the anglicized version of the Ancient Greek name Eukleídes. In English, by metonymy, 'Euclid' can mean his most well-known work, Euclid's Elements, or a copy thereof,[5] and is sometimes synonymous with 'geometry'.

As with many ancient Greek mathematicians, the details of Euclid's life are mostly unknown. He is accepted as the author of four mostly extant treatises—the Elements, Optics, Data, Phaenomena—but besides this, there is nothing known for certain of him.

Euclid's date of death is unknown; it has been speculated that he died c. 270 BC.

Archimedes

Archimedes of Syracuse was an Ancient Greek mathematician, physicist, engineer, astronomer, and inventor from the ancient city of Syracuse in Sicily. Although few details of his life are known, he is regarded as one of the leading scientists in classical antiquity. Considered the greatest mathematician of ancient history, and one of the greatest of all time, Archimedes anticipated modern calculus and analysis by applying the concept of the infinitely small and the method of exhaustion to derive and rigorously prove a range of geometrical theorems. These include the area of a circle, the surface area and volume of a sphere, the area of an ellipse, the area under a parabola, the volume of a segment of a paraboloid of revolution, the volume of a segment of a hyperboloid of revolution, and the area of a spiral.

Archimedes was born c. 287 BC in the seaport city of Syracuse, Sicily, at that time a self-governing colony in Magna Graecia and lived for 75 years before his death in 212 BC.

> GIVE ME THE PLACE TO STAND,
> AND I SHALL MOVE THE EARTH.
> -ARCHIMEDES

Brahmagupta

Brahmagupta was born around 598 CE in the city of Bhinmal, which is now located in the state of Rajasthan, India. He belonged to the Shaivite sect of Hinduism.

Brahmagupta received his education in mathematics and astronomy, likely within the traditional Indian educational system of that time. He gained expertise in both fields and began his career as a mathematician and astronomer.
His most famous work, the "Brahmasphutasiddhanta" covered various mathematical and astronomical topics, including arithmetic, algebra, geometry, and astronomy. It contained groundbreaking ideas and mathematical techniques that influenced subsequent scholars in India and beyond.

He introduced concepts such as zero, negative numbers, and methods for solving quadratic equations. He also made important contributions to geometry and trigonometry.

Brahmagupta's works had a lasting impact on the development of mathematics and astronomy in India and neighboring regions. His ideas were later transmitted to the Islamic world and Europe, where they influenced the works of later scholars such as Al-Khwarizmi and Leonardo Fibonacci.

His legacy lives on through his contributions to the fields of mathematics and astronomy.

Bhaskara ll

Bhaskara II, also known as Bhaskaracharya, was an Indian mathematician and astronomer who lived during the 12th century CE. He was born in 1114 CE in Bijapur, Karnataka, India. Bhaskara II's most famous work is the Siddhanta Shiromani, a comprehensive treatise on astronomy and mathematics, which consists of four parts: Lilavati (arithmetic), Bijaganita (algebra), Goladhyaya (celestial sphere), and Grahaganita (mathematics of planets).

In Lilavati, Bhaskara II covers various topics in arithmetic, including fractions, arithmetic progressions, and problems involving permutations and combinations. Bijaganita focuses on algebra and includes solutions to quadratic, cubic, and quartic equations. His methods for solving indeterminate equations were particularly innovative and influential.

Bhaskara II's contributions to astronomy were also significant. In Goladhyaya, he discusses celestial objects, planetary motions, eclipses, and the cause of day and night. Grahaganita deals with mathematical calculations related to the positions and motions of planets.

In addition to his scholarly pursuits, Bhaskara II made practical contributions to the field of mathematics, such as developing methods for accurately predicting eclipses and understanding the motion of celestial bodies.

Bhaskara II's work had a profound impact on the development of mathematics and astronomy in India and beyond. His methods and ideas were influential in shaping subsequent mathematical and astronomical scholarship in the Indian subcontinent.

Bhaskara II's contributions to mathematics and astronomy earned him widespread recognition and acclaim both during his lifetime and in the centuries that followed. He remains an important figure in the history of mathematics and astronomy, celebrated for his pioneering work and profound insights.

> “A PERSON WHO CAN, WITHIN A YEAR, SOLVE X2 - 92Y2 = 1 IS A MATHEMATICIAN.
> -BRAHMAGUPTA”

Blaise Pascal

Blaise Pascal was a French mathematician, physicist, inventor, writer, and Catholic theologian.

Blaise Pascal was born on June 19, 1623, in Clermont-Ferrand, France. His father, who was also interested in mathematics and science, homeschooled him. By the age of 12, Pascal had already begun studying Euclidean geometry and discovered his own theorems.

At 16, he wrote a significant treatise on projective geometry called "Essai pour les coniques" ("Essay on Conics"). This work earned him recognition among mathematicians of his time. Pascal made significant contributions to mathematics throughout his life, including the invention of the Pascaline, one of the first mechanical calculators.

His significant contributions to mathematics include:
Pascal's Triangle: He studied the properties of this triangular array of numbers, which has numerous applications in combinatorics, probability, and algebra.
Pascal's Theorem: He formulated this fundamental theorem in projective geometry, which states that if a hexagon is inscribed in a conic section, then the three points of intersection of opposite sides lie on a straight line.
Probability Theory: Pascal made foundational contributions to the development of probability theory, particularly through his correspondence with Pierre de Fermat on problems related to gambling and chance.
Pascal's Wager: In philosophy, he formulated Pascal's Wager, which argues for belief in God based on the potential consequences of such belief or disbelief.
Mechanical Calculator: Pascal invented one of the earliest mechanical calculators, the Pascaline, which could perform addition and subtraction.

Aside from mathematics, Pascal also made contributions to physics, philosophy, and theology. He conducted experiments on atmospheric pressure, leading to the development of Pascal's law in fluid mechanics. In philosophy, he is known for Pascal's Wager, an argument for belief in God based on the potential consequences of such belief or disbelief.

Pascal's health declined in his later years, and he died on August 19, 1662, at the age of 39. Despite his relatively short life, Pascal's work had a profound impact on various fields of study and continues to influence scholars to this day.

Gottfried Wilhelm Leibneiz

Gottfried Wilhelm Leibniz, born on 1 July 1646, was a German polymath active as a mathematician, philosopher, scientist and diplomat who invented calculus in addition to many other branches of mathematics and statistics
Leibniz has been called the "last universal genius" due to his knowledge and skills in different fields. He is a prominent figure in both the history of philosophy and the history of mathematics
As a mathematician, his major achievement was the development of the main ideas of differential and integral calculus, independently of Isaac Newton's contemporaneous developments. In the 20th century, Leibniz's notions of the law of continuity and transcendental law of homogeneity found a consistent mathematical formulation by means of non-standard analysis. He was also a pioneer in the field of mechanical calculators. While working on adding automatic multiplication and division to Pascal's calculator, he was the first to describe a pinwheel calculator in 1685 and invented the Leibniz wheel, later used in the arithmometer, the first mass-produced mechanical calculator.
Although the mathematical notion of function was implicit in trigonometric and logarithmic tables, which existed in his day, Leibniz was the first, in 1692 and 1694, to employ it explicitly, to denote any of several geometric concepts derived from a curve, such as abscissa, ordinate, tangent, chord, and the perpendicular

Linear systems

Leibniz arranged the coefficients of a system of linear equations into an array, now called a matrix, in order to find a solution to the system if it existed. This method was later called Gaussian elimination He also solved systems of linear equations using determinants, which is now called Cramer's rule

Leibniz is credited, along with Isaac Newton, with the discovery of calculus (differential and integral calculus). According to Leibniz's notebooks, a critical breakthrough occurred on 11 November 1675, when he employed integral calculus for the first time to find the area under the graph of a function $y = f(x)$

Leibniz was the first to use the term analysis situs, later used in the 19th century to refer to what is now known as topology.
He died on 14 November 1716

Srinivasa Ramanujan

Srinivasa Ramanujan FRS was an Indian mathematician. Though he had almost no formal training in pure mathematics, he made substantial contributions to mathematical analysis, number theory, infinite series, and continued fractions, including solutions to mathematical problems then considered unsolvable.

He was born in 22 December 1887 ,Erode, Mysore State, British India (now in Tamil Nadu, India).He was known for Ramanujan's sum, Landau–Ramanujan constant , Mock theta functions, Ramanujan conjecture, Ramanujan prime, Ramanujan–Soldner constant , Ramanujan theta function, Rogers–Ramanujan identities, Ramanujan's master theorem , Hardy–Ramanujan asymptotic formula, Ramanujan–Sato series. He was awarded Fellow of the Royal Society (1918). He died on 26 April 1920 (aged 32)Kumbakonam, Tanjore District, Madras Presidency, British India (now Thanjavur district,
Tamil Nadu, India).

During his short life, Ramanujan independently compiled nearly 3,900 results (mostly identities and equations).Many were completely novel; his original and highly unconventional results, such as the Ramanujan prime, the Ramanujan theta function, partition formulae and mock theta functions, have opened entire new areas of work and inspired a vast amount of further research. Of his thousands of results, all but a dozen or two have now been proven correct.The Ramanujan Journal, a scientific journal, was established to publish work in all areas of mathematics influenced by Ramanujan,and his notebooks—containing summaries of his published and unpublished results—have been analysed and studied for decades since his death as a source of new mathematical ideas.

> AN EQUATION FOR ME HAS NO MEANING,
> UNLESS IT EXPRESSES A THOUGHT OF GOD.
> - SRINIVASA RAMANUJAN

Pavel Samuilovich Urysohn

Pavel Samuilovich Urysohn (3 February, 1898 – 17 August, 1924) was a Soviet mathematician who is best known for his contributions in dimension theory, and for developing Urysohn's metrization theorem and Urysohn's lemma, both of which are fundamental results in topology. His name is also commemorated in the terms Urysohn universal space, Fréchet–Urysohn space, Menger–Urysohn dimension and Urysohn integral equation. He and Pavel Alexandrov formulated the modern definition of compactness in 1923.

Urysohn completed his secondary education in Moscow. While still at school, he worked at Shanyavsky University on an experimental project on X-ray radiation and was supervised by Petr Lazarev.
At that time, Urysohn's interests lay predominantly in physics. Urysohn enrolled at the Moscow State University in 1915 and earned his Bachelor of science in 1915. There he attended the lectures of Nikolai Luzin and Dimitri Egorov, which made him turn his attention to mathematics. Between 1919 and 1921, Urysohn completed a doctorate on integral equations under the supervision of Luzin. He then became an assistant professor at Moscow University, and Egorov prompted him to start working in topology.
By 1922, Urysohn had given topological definitions to curve, surface, and dimension, and his work attracted the attention of many prominent European mathematicians.In the summers of 1923 and 1924, Urysohn and Aleksandrov were staying in a cottage in Brittany, France, when Urysohn drowned at the age of 26 while swimming off the coast nearby Batz-sur-Mer.

P.C. Mahalanobis

In the list of the famous Indian mathematicians P.C.Mahalanobis is one of them.
In 1893, he was born in Kolkata.
He started his education at Brahmo Boys' School, which was founded by his grandfather Guru Charan Mahalanobis in 1904.

Prof. Prasanta Chandra Mahalanobis earned a Bachelor degree in Science with Honours in Physics from the Calcutta University under Presidency College in 1912, before he sailed to England and joined Cambridge University

He obtained Mathematics Tripos part I in 1914, and Physics Tripos part II in 1915 from Cambridge University.

As a student, Prof. Prasanta Chandra Mahalanobis never confined himself in his subject books. He was very interested in various subjects like amateur astronomy, philosophy, architecture, and psychology. Mahalanobis is remembered for the Mahalanobis distance, a statistical measure which is independent of measurement scale introduced by him. Mahalanobis's work in statistics started by analyzing university exam results, anthropometric measurements on Anglo-Indians of Calcutta and also, meteorological problems. He also contributed significantly in developing schemes to prevent floods but his most important contributions came with the large scale sample surveys. He is recognized as the first statistician to introduce pilot surveys and advocating the usability of sampling methods.

It was in recognition of his contributions to science and national service that Mahalanobis was conferred upon with India's highest civilian award, the Padma Vibhushan. The Government of India declared 29th June, the day he was born, National Statistical Day.

Satyendra Nath Bose

Satyendra Nath Bose was born on January 1, 1894, in Calcutta, British India (now Kolkata, India). He studied at Presidency College in Calcutta, where he excelled in mathematics and obtained his Bachelor of Science degree in 1913 and Master of Science degree in 1915. He then pursued further studies at the University of Calcutta, earning his Doctor of Science degree in 1924.

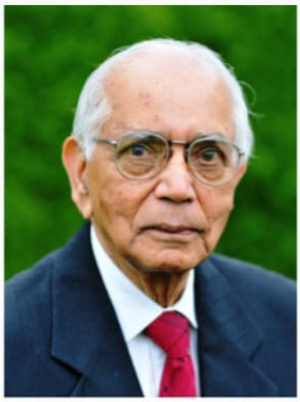
Bose's most significant contribution to physics came in 1924 when he sent a paper on quantum mechanics to Albert Einstein, who recognized its importance and helped get it published. This paper introduced what became known as Bose-Einstein statistics, which describes the behavior of indistinguishable particles with integer spin. It laid the groundwork for understanding the behavior of particles in quantum mechanics, particularly in relation to low temperatures and the formation of Bose-Einstein condensates.

Despite his groundbreaking work, Bose faced difficulties in advancing his career in India due to the lack of research facilities and recognition for theoretical physics. He held various teaching positions throughout his life, including at the University of Dhaka and the University of Calcutta.

In addition to his contributions to physics, Bose was also involved in Indian independence movements and served as a member of the Indian National Congress. He was elected Fellow of the Royal Society in 1958 and received numerous other honors and awards for his work.

Satyendra Nath Bose passed away on February 4, 1974, leaving behind a lasting legacy in the field of physics and as a prominent figure in Indian science. His name is honored through the Bose–Einstein statistics, the Bose–Einstein condensate, and the Bose–Einstein distribution.

Calyampudi Radhakrishna Rao



Calyampudi Radhakrishna Rao, commonly known as C. R. Rao, was born on September 10, 1920, in Hadagali, Karnataka, India. He was a pioneering Indian statistician whose work profoundly influenced the field of statistics and its applications across various disciplines.

Rao studied mathematics at Andhra University and received his Bachelor's and Master's degrees in 1940 and 1942, respectively. He then went on to study at the University of Cambridge, where he completed his Ph.D. in statistics in 1948 under the supervision of R.A. Fisher, a pioneer in the field of statistics.

Throughout his career, Rao made significant contributions to statistical theory and methodology. He developed several statistical techniques, including the Cramér-Rao bound, Rao-Blackwellization, Rao distance, and Rao's Score test. His research covered a wide range of areas in statistics, including linear models, multivariate analysis, design of experiments, and statistical inference.

Rao held various academic positions at institutions around the world, including the Indian Statistical Institute, where he served as the director from 1962 to 1977, and later at universities in the United States, such as the University of Pittsburgh and Pennsylvania State University.

In addition to his academic achievements, Rao received numerous honors and awards throughout his lifetime, including the Padma Vibhushan, India's second-highest civilian award, and the United States National Medal of Science. He was also elected as a Fellow of the Royal Society in 1967.

Despite retiring from active teaching in 1980, Rao remained highly engaged in research and continued to publish prolifically. He authored over 400 research papers and several books, making significant contributions to both theoretical and applied statistics.

C. R. Rao passed away on July 30, 2021, leaving behind a lasting legacy as one of the most influential statisticians of the 20th century. His work continues to be celebrated and utilized by statisticians, researchers, and practitioners worldwide.

Shakuntala Devi

Shakuntala Devi- The Human-Computer of the world as she was called made a great contribution to maths. She was born on 4 th Nov 1929 in a Brahmin family in Bangalore city of India. She had an extraordinary mathematical skill which has inspired millions of students across the world.

Daughter of a circus performer, she travelled with her parents since she was three years old, and is said to have cultivated her calculating abilities while performing card tricks. Once she began to extract cube roots rapidly in her head, she became a performer exhibiting her skills.

She was also the first woman mathematician of India.

Shakuntala Devi was an Indian mental calculator and writer, popularly known as the "Human Computer". Her talent earned her a place in the 1982 edition of The Guinness Book of World Records. However, the certificate for the record was given posthumously on 30 July 2020, despite Devi achieving her world record on 18 June 1980 at Imperial College, London. Devi was a precocious child and she demonstrated her arithmetic abilities at the University of Mysore without any formal education.

In the year 1977, Shakuntla Devi authored a book on mental calculations-- Figuring: The Joy of Number. The same year, she wrote the first book on homosexuality in India titled 'The World of Homosexuals'. In a documentary titled 'For Straights Only', Shakuntala revealed that she was married to a homosexual man and this shifted her interest in the topic to understand it more closely.

On April 21, 2013, Shakuntala died at the age of 83 years old.

> “NUMBERS HAVE LIFE; THEY'RE NOT JUST SYMBOLS ON PAPER.”
>
> - SHAKUNTALA DEVI

Conclusion

In conclusion, E-Ganitham stands as a beacon of mathematical exploration and enlightenment, thanks to the relentless efforts of the Department of Mathematics at St Aloysius College, Edathua. Through this initiative, we plan to go deeper into the profound relevance, rich history, enduring significance, and diverse practical applications of mathematics.

This volume has celebrated the lives and contributions of great mathematicians, inspiring a deep-seated enthusiasm for the subject among our readers. As we embark on future volumes, we eagerly anticipate unraveling additional layers of mathematical intricacies and uncovering the unseen spheres of this captivating discipline. We continue our journey of discovery and appreciation for the beauty and utility of mathematics, as we strive to enrich our understanding and embrace its boundless possibilities.

Acknowledgement

We express heartfelt appreciation to Prof. Dr. Indulal G, Principal of St. Aloysius College, Edathua, for his unwavering motivation and support in bringing e-Ganitham to fruition. Our sincere gratitude extends to him for the invaluable suggestions and uplifting encouragement that enriched this publication.

We also express our sincere appreciation to the dedicated faculty of the Mathematics Department at St. Aloysius College, Edathua. Their commitment to excellence, tireless efforts, and scholarly guidance have played a pivotal role in shaping the content and quality of E-Ganitham. This publication stands as a testament to their collective expertise and passion for fostering mathematical exploration and enlightenment.